F006	Elective 3rd Year	**Introduction to Quantum Mechanics**	L	S	P	ECTS
			3	0	2	6

Course objective. Connect the historical development of quantum mechanics with previous knowledge and learn the basic properties of quantum world. Students will develop understanding and relating the events which led toward the development of quantum mechanics, understanding the basic principles of wave mechanics, ability to solve simple problems exactly, relating the knowledge of mathematics to the formalism of quantum mechanics and adapting the gained knowledge to high school generations.

Prerequisites. General Physics 1, Differential and Integral calculus.

Course content.

1. Physics by the end of 19th and the beginning of 20th century.
2. Historical development of quantum mechanics.
3. Principles of quantum mechanics.
4. Schrödinger wave mechanics: history and philosophical implications.
5. Basic properties of wave mechanics and applications (potential barriers).
6. Eigenvalues and eigenfunctions of quantum mechanical operators (energy, momentum, orbital momentum).
7. Quantum harmonical oscillator.
8. Hydrogen atom.
9. Electron spin.
10. Electron in magnetic field (electron magnetic moment and nuclear magnetic resonance).

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	pinpoint and understand the historical aspects of the development of quantum mechanics
2.	understand and explain the differences between classical and quantum mechanics
3.	understand the dual nature of matter and the idea of wave function
4.	understand the uncertainty relations
5.	solve Schrödinger equation for simple potentials
6.	spot, identify, describe and relate the eigenvalue problems for energy, momentum, angular momentum and harmonic and central potentials
7.	describe and explain the idea of spin

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max

		**				
Attending lectures	1	1-7	Presence at lectures, discussion, teamwork and independent work during numerical exercises	Activity assessment	0	4
Knowledge test – numerical part	2.5	1-7	Preparation for examination	Written (preparatory) exam	25	48
Knowledge test – theoretical part	2.5	1-7	Preparation for examination	Written (preparatory) exam	25	48
TOTAL	6				50	100

Teaching methods and knowledge assessment. Lectures (theory). Numerical exercises (numerical part). Seminars. Written exams via preparatory exams during the semester (4/semester) from numerical and theoretical part.

Can the course be taught in English: Yes

Basic literature:

1. R. L. Liboff, Introductory Quantum Mechanics, Addison-Wesley, 2003.
2. D.J. Griffiths, Introduction to Quantum Mechanics, Pearson Education Inc, New York, 2005.
3. Y. Peleg, R. Pnini, E. Zaarur, Schaum's outline of theory and problems of quantum mechanics, McGraw-Hill, New York, 1998.
4. Supek, Teorijska fizika i struktura materije, Školska knjiga, Zagreb, 1989.
5. L. I. Schiff, Quantum Mechanics, Mc-Graw Hill, New York 1968.

Recommended literature:

1. R.P. Feynman, R.B. Leighton, M. Sands, The Feynman Lectures on Physics – Volume III, Addison-Wesley Publications, Reading, 1966.
2. E.H. Wichmann, Quantum Physics: Berkeley physicscourse – Volume IV, McGraw-Hill, New York, 1971.
3. K. Tamvakis, Problems and Solutions in Quantum Mechanics, Cambridge University Press, Cambridge, 2005.
4. P.A.M. Dirac, Principles of Quantum Mechanics, Oxford University Press, Oxfrod, 1978.
5. P.A.M. Dirac, Lectures on Quantum Mechanics, Dover Publications, New York, 2001.
6. W. Heisenberg, The Physical Principles of the Quantum Theory, Dover Publications, New York, 1949.